geodic masses, in which they have formed by gradual crystallization from the mother-liquor. They differed, however, of course, in being on the outer surface of the spherules."

It is evident from Prof. Houston's paper that this peculiar form of hail was unknown to him, and, as it must also have been unknown to many who have propounded theories as to the formation of hail which will not account for it, I think that a service may be rendered to meteorology by the reproduction of three of the exquisite lithographs of this form of hail given in Prof. Abich's paper, "Ueber krystallinischen Hagel im Thrialethischen gebirge," published at Tiflis in 1871. The hailstones represented in Figs. 1–3 all fell on June 9 (21), 1867, at Bjeloi Kliutsch, a village about twenty miles south-west of Tiflis, and 12,425 feet above sea-level (lat. 41° 33′ N., long. 44° 30′ E.)

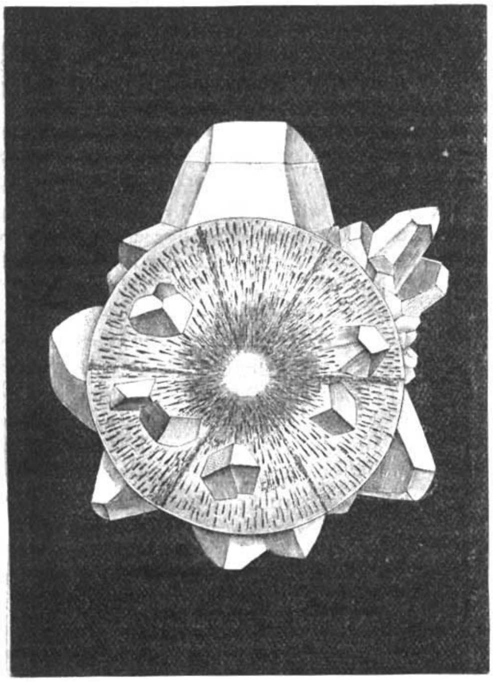

Fig. 3.

Theories of the formation of hail are almost innumerable. I was reading a pamphlet not long since which contained summaries of, I think, twenty-three theories. Some—like Prof. Schwedoff's, that hailstones come from interplanetary space (Brit. Ass. Report, Southampton, 1882, p. 458)—are very droll; but the subject is a very difficult one, and one upon which I do not know of a single good treatise in our language. Possibly, the reproduction of these figures may induce someone to prepare an exhaustive memoir. I could place a large amount of historical and theoretical material at the disposal of any competent person who would undertake the preparation of such a work, it being quite impossible for me to do it myself.

G. J. SYMONS.

NOTES.

AT a largely attended meeting in Edinburgh on Tuesday, Dec. 3, Sir Douglas Maclagan in the chair, it was resolved that Mr. Geo. Reid, R.S.A., should be commissioned to paint a portrait of Prof. P. G. Tait, to be placed permanently in the rooms of the Royal Society of Edinburgh. A committee was appointed to carry out the resolution, including, among others, Mr. John Murray (*Challenger* Expedition), Convener; Mr. Gillies Smith, Hon. Treasurer; Lord President Inglis, Lord Kingsburgh, Lord Maclaren, Sir William Thomson, Sir Arthur Mitchell, Prof. Robertson Smith, Prof. Chiene, Dr. Alexander Buchan, Mr. Robert Cox, and Mr. William Peddie. It was proposed that an etched engraving of the portrait be prepared for distribution among the subscribers, the plate to be destroyed after the required number of copies have been thrown off. It was further resolved that all the Fellows of the Royal Society of Edinburgh, the Professor's old pupils, and others, be afforded an opportunity of taking part in this public recognitition of Prof. Tait's eminent services to science.

ITALY, France, and the United States of America were represented in the elections to foreign membership of the Royal Society on Thursday last. Prof. Stanislao Cannizzaro, of Rome, was elected on the ground of his researches on molecular and atomic weights; Prof. Chauveau, of Paris, for his researches on the mechanism of the circulation, animal heat, nutrition, and the pathology of infectious diseases; and Prof. Rowland, of Baltimore, for his determination in absolute measure of the magnetic susceptibilities of iron, nickel, and cobalt; for his accurate measurements of fundamental physical constants; for the experimental proof of the electro-magnetic effect of electric convection; for the theory and construction of curved diffraction-gratings of very great dispersive power; and for the effectual aid which he has given to the progress of physics in America and other countries.

ADMIRAL MOUCHEZ and MM. Janssen and Perrotin, head astronomers of the Observatories of Paris, Meudon, and Nice, were raised, in November, to the grade of Officer of the Order of the Rose of Brazil, and MM. Frassenet, Paul, and Prosper Henry, admitted to knighthood in the same order. The Paris Correspondent of the *Daily News* says that the diplomas securing to them these distinctions were the last official documents signed by Dom Pedro. He asked his secretary to add a personal compliment to each of the astronomers with whom he was personally acquainted.

SOME time ago we announced that a Physical Society was about to be formed in Liverpool. This has now been done, and we are glad to learn that the new Society begins its career under most favourable conditions. The meeting at which it was constituted was well attended, and displayed much interest in the scheme. Nearly ninety names were at once handed in to the secretary, Mr. T. Tarleton, for membership. Prof. Oliver Lodge, F.R.S., was appointed President. The next meeting will be held in the Physics Theatre, University College, Liverpool, on Monday, the 16th inst., at 8 o'clock, when the President will deliver his inaugural address.

DR. JOHN G. MCKENDRICK, F.R.S., Professor of Physiology in the University of Glasgow, has been elected President of the Philosophical Society of Glasgow.

PROF. LESQUEREUX, the eminent American bryologist and palæontologist, died in his house at Columbus, Ohio, on October 25, at the age of nearly eighty-nine years.

WE regret to learn from a memoir that has been sent to us by Prof. Barboza du Bocage, that Señor José Augusto de Souza died recently at Lisbon, where he was Curator of the Zoological Department in the Museum. He was the author of some useful memoirs on African birds, and is best known for his Catalogue of the *Accipitres, Columbæ*, and *Gallinæ* in the Lisbon Museum.

THE fifth of the series of "One Man" Photographic Exhibitions at the Camera Club will be open for private and press view on Monday, December 16, at 8 p.m., and on and after Tuesday, December 17, it will be open to visitors on presentation of card. The Exhibition will consist of pictures by the late Mr. O. G. Rejlander, and a selection from over 200 of his famous figure and *genre* studies will be shown. The pictures will be on view for about six weeks.

ON November 21 the American Philosophical Society, Philadelphia, celebrated the hundredth anniversary of its first occupation of its present hall. The banquet was a great success. The following were the toasts:—"The language of Science and Philosophy is universal, but adopts various dialectic forms to diffuse knowledge," proposed by Prof. John W. Mallet, representative from the Royal Society of London; "Our kindred Societies in every clime," proposed by Prof. Joseph Lovering, President of the American Academy of Arts and Sciences; "All research into the Book of Nature has not discovered an erratum," proposed by Sir Daniel Wilson, President of the University of Toronto; "The successful pursuit of Science expunges error—it never antagonizes truth," proposed by the Hon. Lyon G. Tyler, President of William and Mary College; "Mental Analysis is the efficient solvent of many difficulties in Science and Philosophy," proposed by the Rev. Dr. Charles W. Shields, Princeton College; and "The labours and achievements of great teachers in Science and Philosophy live after them—these are their monuments," proposed by the Right Rev. Dr. John J. Keane, President of the Catholic University of America.

DR. PAX, of Breslau, has been appointed Curator of the Botanic Garden in Berlin; Mr. D. G. Fairchild, Assistant in the section of Vegetable Pathology in the United States Department of Agriculture; Dr. H. Dingler, Professor of Botany in the Forest Academy of Aschaffenburg; Dr. F. Noll, Professor of Botany in the University of Bonn; and Dr. N. Wille, of Stockholm, Lecturer on Botany at the Royal Agricultural Institution at Aas, near Christiania.

PROF. BORNMÜLLER, Director of the Botanic Garden at Belgrade, has started on a twelve months' botanical tour through Asia Minor. Beginning at Amasia, he will travel through the country between the courses of the Kisil-Irmak and Euphrates, southward to the completely unexplored mountains of Ak-dagh. The *Botanical Gazette* says that this country has only once been explored, thirty-five years ago, by the Russian botanist Wiedemann. According to the same authority, Prof. Bornmüller is a young and very successful explorer, with a great deal of experience, especially from his long journey in 1886, through Dalmatia, Monte Negro, Greece, Turkey, East Bulgaria, and Asia Minor. His original collection will be transferred to Weimar, where it will be carefully gone through by Prof. Hausknecht.

THE "mountain laurel," or *Kalmia*, and the Indian corn, are suggested in American papers as national flowers for the United States.

IN the December number of the *Kew Bulletin* Mr. Thiselton Dyer explains that for some years, when it has been necessary to find space in the Palm House at Kew for the development of new and interesting species of palms, he has not hesitated to transfer to the Temperate House plants which he thought would probably endure a lower temperature. The experiment has been most successful, many of the plants luxuriating in the change. Anxious to obtain further information as to cool cultivation of tropical and sub-tropical plants, Mr. Dyer lately applied for leave to send Mr. Watson, assistant curator at Kew, to the south of France to report on what he might be able to observe. Permission was given; and Mr. Dyer's statement is followed by a series of valuable and interesting notes in which Mr. Watson sums up the results of his mission. His journey took place in the latter part of October. He had a fortnight at his disposal, and during that time he visited as many gardens as possible between Hyères and Mentone. One of the most interesting of the gardens visited was a branch establishment, at Hyères, of the Société d'Acclimatation, Paris. Here a good deal of experimental gardening is practised, plants of all kinds being planted and tested as to their hardiness, &c. Mr. Watson says that while he was inspecting these gardens the idea was suggested "that a well-managed botanical station, devoted chiefly to experimental testing, proving, and breeding operations amongst plants, would, if established in some such favoured locality as Hyères, be capable of much valuable work."

THE following are the lecture arrangements at the Royal Institution, so far as they relate to science, before Easter:—Prof. A. W. Rücker, six Christmas lectures to juveniles on electricity; Prof. G. J. Romanes, ten lectures on the post-Darwinian period; Mr. Frederick Niecks, four lectures on the early developments of the forms of instrumental music (with musical illustrations); Prof. Flower, three lectures on the natural history of the horse and of its extinct and existing allies; the Right Hon. Lord Rayleigh, seven lectures on electricity and magnetism. The Friday evening meetings will begin on January 24, when a discourse will be given by Prof. Dewar on the scientific work of Joule. Succeeding discourses will probably be given by Sir Frederick Abel, Mr. Henry B. Wheatley, Prof. J. A. Fleming, Mr. Shelford Bidwell, Prof. C. Hubert H. Parry, Mr. Francis Gotch, Prof. T. E. Thorpe, Prof. G. F. Fitzgerald, the Right Hon. Lord Rayleigh, and other gentlemen.

MESSRS. MACMILLAN AND CO. will shortly publish the first part of Prof. Eimer's work on "Organic Evolution as the Result of the Inheritance of Acquired Characters according to the Laws of Organic Growth," translated by J. T. Cunningham, M.A., F.R.S.E., late Fellow of University College, Oxford.

MESSRS. BLACKWOOD AND SONS have just published "The Construction of the Wonderful Canon of Logarithms," a translation of "Mirifici Logarithmorum Canonis Constructio," by John Napier, of Merchiston. The work was published in 1619, but is so rare as to be very little known, being only once reprinted in 1620, and never translated. The present translation is by William Rae Macdonald, who also contributes notes and a catalogue of Napier's works.

SLIGHT shocks of earthquake, lasting from five to ten seconds, were felt on Sunday, at Taranto, Foggia, Chieti, Montesaraceno, Agnone, Ancona, and Urbino. At Torremileto, in the province of Foggia, a strong shock is said to have been felt; and a slight shock, followed by a somewhat stronger one, occurred at Naples soon after 6 a.m. On Monday there were seismic disturbances in Dalmatia, Bosnia, and Herzegovina. According to a telegram, through Reuter's Agency, from Vienna, a somewhat severe shock was felt on Monday, at 6.30 a.m., at Knin, Dernis, Sebenico, Trau, Scardona, and Spalato, the direction of the movement being from north-east to south-west. A violent shock, lasting five seconds, occurred at 6.40 at Serajevo, being felt three minutes later at Novi and Krupa also.

AT the ordinary meeting of the Council of the Sanitary Assurance Association, on Monday last, arrangements were completed for a series of lectures during January and February 1890, in the theatre of the College of State Medicine, Great Russell Street. The series will include the following:—Mr. H. Rutherfurd, barrister-at-law, on "House Sanitation from a Householder's Point of View," Sir Joseph Fayrer, F.R.S., in the chair; Prof. T. Roger Smith, on "Household Warming and Ventilation," Sir Douglas Galton, F.R.S., in the chair; Mr. Mark H. Judge, on "The Sanitary Registration of Buildings Bill," Lord Henry Bruce, M.P., in the chair. The object of the Association being to promote good sanitary arrangements in the houses of all classes of the community, both men and women are invited to these lectures. Discussion is invited.

The "Fauna of British India," of which we noticed the first volume of fishes last week, is making steady progress. Mr. Eugene Oates will produce the first volume of the birds of India during the present month. The work will be principally founded on the great Hume Collection in the British Museum, and the author of the "Hand-book of the Birds of British Burmah," may be trusted to give a thoroughly good account of the birds of India. Side by side with his three volumes on Indian ornithology, Mr. Oates will also publish a new edition of Mr. A. O. Hume's "Nests and Eggs of Indian Birds," which has long been out of print. For this purpose Mr. Hume has intrusted to Mr. Oates the whole of the material collected by him for a second edition, and there is no doubt that the work will be warmly welcomed by naturalists. Portraits of some of the leading men who have contributed to the history of Indian ornithology will be given in this new edition, and will form an interesting feature of the work.

Mr. Francis Nicholson, a well-known Manchester ornithologist, is about to issue an English translation of Sunderall's "Tentamen," with a memoir and portrait. This work will be welcome at the present time, when increased attention is being paid to the classification of birds.

Mr. Seebohm will, we understand, propound his system of arrangement of the class Aves in the January number of the *Ibis*, and the memoir will doubtless be a valuable one, as the author is known to have devoted close study to the subject during the past two years.

Mr. A. P. Goodwin, who was with Sir William McGregor on his recent exploration of Mount Owen Stanley, is about to start on a lecturing tour in America. He was successful in taking several interesting photographs of the country visited by the Expedition, and he paid especial attention to the habits of the Birds of Paradise and the Bower-birds. He has some remarkable sketches of the playing-grounds of some of the latter, notably of *Amblyornis subalaris*, of Sharpe, which rivals in decorative faculty the Gardener Bower-bird (*Amblyornis inornata*) of North-Western New Guinea.

Prof. Giard has recently discovered a micro-organism which possesses the power of conferring luminosity or phosphorescence upon different crustaceans. This microbe was found in the tissues of *Talitrus*, and is easily cultivated in appropriate media. It soon kills *Talitrus*.

M. Loubat, member of the New York Historical Society, has presented the French Academy of Inscriptions with a sum producing 1000 francs per annum; his intention being that a prize of 3000 francs shall be offered every three years for the best printed work concerning the history, geography, archæology, ethnography, linguistics, and numismatics of North America. The first prize will be granted in 1892, and the Academy has decided that the works submitted for consideration shall not relate to matters referring to an earlier date than 1776. The competition will be open to the author of any work on the subject published after July 1, 1889, in any of the following languages: Latin, French, English, Spanish, and Italian. Two copies must be sent to the Secretary of the French Institute before December 31, 1891.

In the Pacific Coast region there are now four flourishing colonies of introduced pheasants. Dr. C. Hart Meriam, who refers to the subject in his last Report to the American Agricultural Department, says that the most northerly of these colonies is at the south end of Vancouver Island, near Victoria; the second in Protection Island, in Puget Sound; the third at the junction of the Willamette River with the Columbia; and the fourth in the middle portion of the Willamette Valley. The two latter colonies are now separated by so narrow a strip of territory that they will doubtless become united during the next few years. All the pheasants of the three colonies last mentioned appear to have been imported from China by Judge O. N. Denny.

The American Agricultural Department has been making careful inquiry as to the food of crows; and the result, as set forth in a Report by Mr. Walter B. Barrows, is likely to surprise those who have always contended that these birds do very much more good than harm. It is not disputed that they destroy injurious insects, that they are enemies of mice and other rodents, and that they are occasionally valuable as scavengers; but these services are slight in comparison with the mischief for which they are responsible. The injury done by them to Indian corn, wheat, rye, oats, and other cereals is enormous. According to one observer, the crow eats corn "from ten minutes after planting until the blades are three inches high;" and more than a score of other observers testify that he not only pulls up the young plants, but digs up the newly sown seed. His depredations extend to potatoes, sweet potatoes, beans, pea-nuts, cherries, strawberries, raspberries, and blackberries; and he widely distributes certain poisonous plants, the seeds of which are improved rather than impaired by passage through his digestive organs. As if all this were not enough, it is shown that the crow eats beneficial insects, and that he makes himself a most formidable nuisance by destroying the eggs and young both of domesticated fowls and wild birds.

Two new seismoscopes, made by Brassart Brothers, of Rome, and adopted at the Italian meteorological stations, are described in the *Rivista Scientifico-Industriale* of October 15. They are of a very simple nature, the one consisting merely of an iron rod, about 5 inches long, leaning slightly against an adjustable screw support near its middle, and with its lower pointed end in a cup. When a shock or tremor occurs, the rod falls away from its support and is caught by a fixed metallic ring making electric contact and ringing a bell. In the other instrument, the ring is connected with a hinged lever arrangement, which stops the mechanism of a timepiece, showing when the shock occurred.

The National Association for the Promotion of Technical and Secondary Education has issued an excellent Report on the existing facilities for technical and scientific instruction in England and Wales As Mr. Acland and Mr. Llewellyn Smith explain in a prefatory note, the Report is not intended so much for experts as for those who wish to obtain, without consulting many Blue-books and other official documents, some trustworthy information as to what is being done. The facts have been arranged with the utmost care, and the work ought to be of considerable service in helping to show "what are the gaps in our educational system that must be filled, and how great is the need for the re-organization and improvement of existing agencies."

The Annual Report of the Manchester Literary and Philosophical Society, published in vol. ii., 4th series, of the Proceedings, shows a marked improvement in the financial condition of the Society, the membership being only one less than at the corresponding period last year. The volume contains many papers and abstracts of papers of varying interest. There is a long paper on "*Hymenoptera Orientalis*" by Mr. Cameron, giving descriptions of the various species, their habits and localities, and references to the literature of the subject. Dr. A. Hodgkinson communicates an interesting paper on the "Physical Cause of Colour in Natural and Artificial Bodies," recording experiments which tend to show whether the colour is produced by a structure of thin plates, or one of fine lines. There are two papers on leaves from the cutting of the Ship Canal, one giving a general description, and the other, by Dr. Schunck, F.R.S. showing that the green colouring-matter, which has proved to be so permanent, is due to a modified form of chlorophyll; spectroscopic examination of the colouring-matter showed it to be identical with that produced by the action of dilute hydrochloric acid on ordinary chlorophyll.

THE Middlesex Natural History and Science Society has issued a volume containing its Transactions during the session 1888-89. The volume opens with an interesting Presidential address by Prof. Flower, on the Natural History Museum, Cromwell Road, and some recent additions thereto. Mr. E. M. Nelson has an illustrated paper on diatom structure; and Mr. J. A. Brown contributes a paper, also illustrated, on working sites and inhabited land surfaces of the Palæolithic period in the Thames Valley.

THE fourth volume of "Blackie's Modern Cyclopædia" has been issued. It begins with the word "fire" and ends with "Ilorin." The work, as we have said on former occasions, is admirably edited by Dr. C. Annandale. The articles are necessarily brief; but, so far as we have been able to test them, they are clear and accurate. There is no falling off in the present volume.

MESSRS. WARD, LOCK, AND CO., have added to their "Minerva Library of Famous Books" a reprint of Dr. A. R. Wallace's fascinating "Narrative of Travels on the Amazon and Rio Negro." A biographical sketch of the author is contributed by Mr. G. T. Bettany, the editor of the series; and the volume includes a portrait of Dr. Wallace, a map, and full-page illustrations.

HAZELL'S Annual for 1890—the fifth issue—has been published. It is edited by Mr. E. D. Price. An immense quantity of information, alphabetically arranged, has been packed into this useful volume. Many articles which the editor describes as "new and important" have been inserted in the present issue.

A SCIENCE CLUB has been formed among the students of the University of St. Andrews for the purpose of developing the interest already taken in scientific pursuits. Prof. W. C. McIntosh, F.R.S., has been elected Hon. President for the session 1889-90.

ANOTHER important paper by M. Henri Moissan upon the perfected mode of preparation and upon the density of fluorine, is contributed to the current number of the *Comptes rendus*. Since the appearance of his paper of two years ago, M. Moissan has employed an electrolysis apparatus of much larger size, and has added to it an accessory apparatus by means of which the gas may be obtained quite free from vapour of hydrofluoric acid, which, as described in NATURE last week, is the cause of the destructive action upon platinum. The platinum U-tube of the new apparatus has a capacity of 160 c.c., and contains during the electrolysis 100 c.c. of hydrofluoric acid. The exit tube at the positive side, from which the fluorine is liberated, is continued into a small platinum spiral condenser immersed in a bath of methyl chloride at − 50° C., where all but the last trace of hydrofluoric acid is retained. From this the gas is led through two platinum tubes filled with fragments of sodium fluoride, a salt which combines with hydrofluoric acid with great energy, forming hydrogen sodium fluoride. By these means the fluorine is obtained perfectly pure, and is quite invisible in dry air, no trace of fuming being apparent, as is the case before purification. In order to determine the density of the gas, a couple of ingeniously constructed platinum flasks have been employed. Each of these flasks is closed by a cylindrical stopper also of platinum; to the side of the neck a side tube is attached on a level with the centre of the stopper. Through the stopper an aperture is bored in such a manner that, when the stopper is rotated into a certain position, connection is established between the interior of the flask and the side tube. A vertical tube also passes through the stopper and penetrates to near the bottom of the flask; this tube is also closed at its upper end by means of a platinum stopper. The stoppers are finely polished and adjusted with great care. Each flask weighs about 70 grams and has a capacity of about 100 c.c. In the density determinations the two flasks were counterpoised on the two pans of the balance. One of them was then filled with pure dry nitrogen gas, which was subsequently displaced by the pure fluorine, the electrolysis apparatus being connected with the upper end of the vertical tube of the density flask by means of flexible platinum tubing. The fluorine was allowed to pass through the apparatus for five minutes after cold silicon was readily ignited by the gas issuing from the side exit tube. The stopper of the flask was then rotated through half a revolution, so as to completely shut off the exit tube, and the stopper of the vertical tube replaced. The flask was again weighed against the other flask containing air, and the difference of weight noted. The amount of residual nitrogen was estimated by opening the stopper of the vertical tube under water, when the fluorine instantly decomposed an equivalent of water, liberating oxygen and forming hydrofluoric acid. The mixture of oxygen and the residual nitrogen was then collected, and the oxygen absorbed by pyrogallic acid and potash. Three determinations yielded, for the density of fluorine compared with that of hydrogen, 18·22, 18·26, and 18·33. These values appear to indicate that the number 19, usually taken as representing the atomic weight of fluorine, is slightly too high, and this view is confirmed by the low numbers obtained in former determinations of the density of phosphorus trifluoride.

THE additions to the Zoological Society's Gardens during the past week include a Malayan Bear (*Ursus malayanus* ♀) from Malacca, a Gold Pheasant (*Thaumalea picta* ♀) from China, presented by Captain Bason; a Common Squirrel (*Sciurus vulgaris*), British, presented by Mr. W. Aubrey Chandler; a Mexican Deer (*Cariacus mexicanus* ♂) from Peru, a Grey-breasted Parrakeet (*Bolborhynchus monachus*) from Monte Video, deposited; an American Bison (*Bison americanus* ♂ born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m., December 12 = 3h. 27m. 9s.

Name.	Mag	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G. C. 768	—	—	3 39 39	+23 14
(2) D.M. + 71° 201 ...	7	Reddish-yellow.	3 18 56	+71 29
(3) ε Eridani	3	Yellow.	3 27 5	− 9 51
(4) ζ Eridani	4	White.	3 10 5	− 9 14
(5) 27*a* Schj.	7	Red-yellow.	3 32 21	+62 18
(6) R Lacertæ	Var.	Orange.	22 38 23	+41 48

Remarks.

(1) The General Catalogue description of this nebula is as follows:—!!! Bright; very large, irregular figure. According to Tempel, this is a variable nebula, and its spectrum, which has not yet been recorded, will therefore have a special interest. Continued observations may, very probably, give a clue to the origin of the variability.

(2) Dunér classes this with stars of Group II., but states that the spectrum is only feebly developed. Further observations are necessary before it can be placed in position on the "tem-